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ABSTRACT

This study was designed to determine what happens to the intelligence quotient of freshman students during their enrollment at a private Negro college. The Otis Quick-Scoring Mental Ability Test, Gamma Em, was administered to 822 students from a population of approximately 2,000 in their freshman year at Hampton Institue, Hampton, Virginia. The Institute is a private, predominantly Negro, nonsectarian, co-educational, liberal arts college. A sample of these students were retested in their sophomore, junior, and senior years. Because of the relatively small number of gains, there did not appear to be an adequate basis for concluding that college years had a significant impact upon the intelligence quotient of these students. Findings were inconclusive as two prime variables, test practices and socioeconomic influences, were not accounted for. The findings are also held to be unexplainable without further investigation. Suggestions for further study include the effects of self-concept, frustration, paternalistic college environment, home and religious influences, and segregation upon test performance. Tables of test scores and results are provided. (RJ)

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Influence of College Experience on Intelligence Quotients of Negro Students

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THE INFLUENCE OF COLLEGE EXPERIENCE ON INTELLIGENCE QUOTIENTS OF NEGRO STUDENTS

Beatrice R. Buszek and Blythe C. Mitchell

INTRODUCTION

This is a study to determine what happens to the intelligence quotient of Freshman students during their enrollment at a private Negro college.[1]

The purpose and design of the study are timely with the current emphasis on formal education. Research dealing with the social nature of education is seriously lacking and is almost non-existent in the area of Negro college students.[2] It is hoped that the findings reported here will encourage further research of a similar nature.

Educational research designed and published by the Negro educator and at the predominantly Negro institution is historically scarce. Until recent years there was neither interest nor support for comparative research, and the ever-growing emphasis on test scores, at least at first glance, seems to support the bias of the American public. Negro educators may have recognized the

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1 At the date of this study, fewer than two percent of the students were White.

2 Similar research is now on-going at Northfield School in Massachusetts with a group of 21 ABC (A Better Chance) and 50 Upward Bound Girls at 9-12th grade levels. Both groups are segments of the U.S. Office of Economic Opportunity program.

danger inherent in statistical data alone. Such data tell only a small part of the story, yet how many people seek truth and how many seek reinforcement of their prejudices? Times have changed and today the popular approach to the study of IQ change infers that the subject is being perceived in a broad sense and there is the assumption that whatever change occurs has been effected by a number of social influences. The social psychologist supports this emphasis but lacks the evidence of pertinent research to identify those factors that most influence test scores. The persistent problem continues to be that of measurement. Since all cultural elements cannot be identified and objectively evaluated, there is the tendency for the educator to settle for the pragmatic conclusion that somehow the total experience must contribute to positive change (growth). Such philosophy operates without design and many such hastily conceived and financed programs now dot the college campuses. An educationally-economically "disadvantaged" group is easily identified, but such factors as the quality of the exposure, the effect on the individual, and the multiple social forces simultaneously operating are a hazard in such analyses, thus making many findings inconclusive.

The present study has attempted to isolate one facet of change with a selected group at one educational level - a change in the measured intelligence of Negro college students. The findings are not conclusive but may add something to the knowledge of the nebulous concept of intelligence. They also provide data for hypotheses relating to the influence of the one-to-three-year interval, the effect of the "enrichment" quality of the college years, the cognitive style of the Negro student and the socio-psychological elements contributing to a change or non-change in IQ. From such studies it will be apparent

that a scientific analysis of change in IQ on a college campus cannot be conclusive without a deeper analysis into the specific cultural components that make up the institution. Research at the fact-finding level is essential before a specific analysis can have meaning.

The data describing IQ change over a one-to-three year interval are presented in Tables 1 through 21, and are not felt to warrant a more penetrating analysis than that presented here. Reports of similar studies of repeat intelligence testing of college groups could not be located by the researchers. There is, therefore, no base for comparison; i.e., no data for adult populations over one-to-three year periods, particularly those covering the college years.

POPULATION

The sample consisted of 822 students from a population of approximately 2000 students enrolled at Hampton Institute in Hampton, Virginia. This Institute is a private, predominantly Negro, non-sectarian, co-educational, liberal arts college. In Table 1 the sample is described in terms of college classification (class), course major and sex.

PROCEDURES

On file at Hampton Institute in 1965-66 were the answer sheets on the Otis Quick-Scoring Mental Ability Test: Gamma Em,[3] for tests administered to all students in September of their Freshman year. A sample of students in each class were retested with the same test, and each student's 1965-66 IQ was compared with that on

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[3] The Gamma Em test went out of print in 1965; and in September 1967 the entire Quick-Scoring series was replaced by a new edition known as the Otis-Lennon Mental Ability Test.

TABLE I

Distribution of the Sample of 822 Students by College Classification, Course Major and Sex

College Classification	MAJOR							
	Arts and Sciences	Business	Education	Home Economics	Nursing	Social Science	Technology	Total
Freshman	50	-	-	15	28	-	43	136
Sophomore	54	41	68	17	13	71	26	290
Junior	40	34	55	8	6	46	17	206
Senior	24	28	62	17	6	30	23	190
Total	168	103	185	57	53	147	109	822
Sex								
Male	85	50	38	-	-	55	105	333
Female	83	53	147	57	53	92	4	489
Total	168	103	185	57	53	147	109	822

his earlier test. Average differences were tested for statistical significance, with a separate comparison being made for the following sub-groups: males and females, each of four college classes, and the seven listed majors.

The sample retested did not constitute the entire group of students who had been first tested at entrance, nor was it a random selection of them as would be desired, since not all full-time Freshmen, Sophomores, Juniors and Seniors who were requested to appear for retesting did so. The design and purpose of the study had been explained, but not all students could or would participate. The group of 822 cases for which data are reported here represents

about 50 per cent of those eligible for retesting. Such a method of selection is a source of contamination as one is not aware of the dynamics involved in the individual decision to be retested. Were those who cooperated a representative group? Probably not, but neither can one assume that only the brighter, better motivated students responded. Both the lower-scoring or the more ambitious students might have perceived this as an opportunity to acquire a higher score for the record. Each year some students had dropped out or transferred, for whatever reason, leaving a more selected group in each class.

The retests were administered by the Director of the Testing Center. The identity of the examiner at the first (Freshmen) testing is not on record; however, an earlier study at the college showed no significant difference in the scores of Negro students when identical tests were simultaneously administered to comparable groups of students by a white and by a Negro examiner.

TABLE 2

Class Means and Standard Deviations of IQ on First and Second Testings

Class*	N	Approximate Interval Between Tests	Mean			Standard Deviation	
			First Test	Second Test	Gain	First Test	Second Test
Freshman	136	6 months	110.04	115.77	5.73	8.90	8.09
Sophomore	290	1½ years	110.28	114.79	4.51	8.76	8.41
Junior	206	2½ years	110.14	113.89	3.75	9.27	8.87
Senior	190	3½ years	108.62	112.91	4.29	9.90	11.68
Total	822		109.82	114.29	4.47	9.19	9.37

* At time of second test.

RESULTS

A summary of the Means and Standard Deviations for the first and second testings of the same students is given in Table 2. All differences (gains) in Means were shown to be significant at the .01 level (see Table 3 for t-values).

TABLE 3

Comparison of the Mean Gains Made by the Four Classes, for Which the Test-Retest Time Intervals Differed

Pairing	Difference	Standard Error of Difference	t
(1) Freshman-Freshman	5.73	.51	11.2
(2) Freshman-Sophomore	4.51	.33	13.7
(3) Freshman-Junior	3.75	.40	9.4
(4) Freshman-Senior	4.29	.62	6.9
Differences			
(1) Gain — (2) Gain*	1.22	.61	2.0*
(1) Gain — (3) Gain**	1.98	.65	3.0**
(1) Gain — (4) Gain#	1.44	.80	1.8#
(2) Gain — (3) Gain#	.76	.52	1.5
(2) Gain — (4) Gain#	.22	.70	.3
(3) Gain — (4) Gain#	- .54	.74	.7

* Significant at .05 **Significant at .01 #Not significant

In order to see if the gains for the Freshman-to-Freshman, Freshman-to-Sophomore, Freshman-to-Junior and Freshman-to-Senior intervals were significantly different from one another, the test of statistical significance was applied. The findings are shown in Table 3. (For the remainder of the study, the paired Testings shown above will be referred to by Fr-Fr, Fr-Soph, Fr-Jr and Fr-Sr, respectively.)

There is no apparent reason for the lower (but statistically insignificant) Fr-Jr gain of only 3.75 as compared to the Sophomore and Senior gains. This trend to relatively low improvement is consistent throughout the entire study for this Junior group. No special selection criteria were operating two years earlier when this group was admitted and their average entrance IQ was not unusual (110.14). Only the Fr-Fr gain is shown to be really different from each of the three lesser gains over longer periods. Since there is no statistically significant difference among the Fr-Soph, Fr-Jr and Fr-Sr gains, it is assumed that the differences are not related to length of period ($1\frac{1}{2}$, $2\frac{1}{2}$, $3\frac{1}{2}$ years) between these testings. When it is further noted that the greatest gain occurred for the smaller time interval (Fr-Fr, $\frac{1}{2}$ year) one would conclude that time is not the critical factor operating. What possible influences, then, might have contributed to the gains in demonstrated IQ? May it be assumed that practice effect, including a certain acquired test-taking "know how," rather than environmental stimulation, is the prime factor operating?

SEX DIFFERENCES IN MEAN GAINS

The IQ means of the male and of the female students on the first and the repeat test are shown in Table 4.

Table 4

Comparison of Male and Female Gains in Mean IQ

Sex	N	Gain	Standard Error	t
Male	333	5.62	.33	17.0
Female	489	3.49	.31	11.3
Difference		2.13**	.45	2.13 ÷ .45 = 4.6**

** The greater gain made by the Male students represents a highly significant difference.

The socio-psychological pattern of the Negro male -- his natural rebelliousness to such instruments as tests and schooling generally – do not appear consistent with the highly significant difference between the male and the female mean gain. Are there implications in this finding? (Comparative research would be needed to identify any differentiated cultural influence; i.e., can we assume that new status, roles, expectations and opportunities now available for Negro males motivate them more than males in the general population tend to be motivated? Or may it be frustration and hostility on the part of the male at the Negro college that explains his generally larger gain in IQ? Is it possible that male students develop greater "test-wiseness" than females do, and the findings reflect this phenomenon?)

INDIVIDUAL TEST-RETEST CHANGES

In addition to a comparison of the four pairs of group means, an analysis was made of the individual changes between the two testings. The distribution of these shifts in IQ and a summary of their direction is shown in Table 5.

TABLE 5

Distribution of IQ Changes, First to Second Testing

Change in IQ	Fr-Fr	Fr-Soph Fr-Jr Fr-Sr	Total Group Frequency	Total Group Cumulative Percentage Frequency from Point of 0-Change*
More than +27		1	1	100.0
+25 to +27	2	1	3	99.8
+22 to +24	-	1	1	99.3
+19 to +21	-	5	5	99.2
+16 to +18	5	8	13	98.4
+13 to +15	10	28	38	96.2
+10 to +12	15	78	93	90.0
+ 7 to + 9	26	122	148	74.8
+ 4 to + 6	26	127	153	50.5
+ 1 to + 3	27	128	155	25.4
0	8	46	54	
- 1 to -3	13	87	100	63.3
- 4 to -6	1	34	35	85.4
- 7 to -9	2	14	16	95.6
-10 to -12	1	4	5	98.7
-13 to -15		1	1	99.4
More than -15		1	1	100.0
Total	136	686	822	

* To the far limit of each interval, for gains and losses separately.

SUMMARY

	Gains	No Change	Losses	Total
All Cases	610	54	158	822
(Fr-Fr only	110	8	17	136)

It is noted that the range of shifts is from a gain of 27 to a loss of 4 IQ points, and that the larger frequencies are for relatively small gains.

The percentages were cumulated from the 0-change point out to the large changes, showing, for example, that 74.8% of the gains were of fewer than 10 IQ points, leaving only 25.2% of 10 or more. Of the total number of losses (158 of the 822 pairings) 95.6% were of fewer than 10 points. (It is noted that of the 136 Fr-Fr testings, there was a loss as great as 10 points in only one instance.) These changes would have to be interpreted as minimal. With the standard error of an individual IQ approximately 5 points, a change - either gain or loss - of as much as 9 points would be only slightly greater than the standard error of the difference. Considering gains and losses together then, only 161 or 19.6%, of the total number of test-retest changes (822) would have real significance. For the longer-interval retestings, omitting the Fr-Fr retestings, this per cent is 18.7. The conclusion is thus clear; i.e., that only a relatively small proportion (one out of each five or six students) made what might be considered real improvement on his Sophomore, Junior or Senior test compared to the one he had taken as a Freshman. (Interpreted statistically, the 10 point criterion used here as a minimum difference is 1.4 times the estimated 7-point standard error of the difference, and is therefore at the 84 out of 100 probability level of significance. A difference would have to be as great as 14 IQ points to reach the 95 out of 100 level of significance.)

Further study was made of the relatively large IQ changes by

the 686 students retested as upperclassmen, with the results presented later in this report.

STABILITY OF IQ'S

The product-moment correlation between IQ on the freshman test and IQ on the subsequent test as a sophomore, junior, or senior was .75, a figure indicating a very high degree of consistency. Since the test-retest interval was from 1½ to 3½ years, and actual changes in intelligence may have occurred over the interval, the two testings were not necessarily measuring the same thing. Thus the correlations cannot be considered as a full expression of the reliability of the Otis Gamma test; rather, the .75 represents a minimum reliability estimate.

By Interval. The test-retest correlation by length of intervening time is shown by the values found for the four class groups:

	Approximate Interval	N	r
Fr to Fr	½ year	136	.76
Fr to Soph	1½ years	290	.78
Fr to Jr	2½ years	206	.80
Fr to Sr	3½ years	190	.70

The difference between the highest value (.80) and the lowest value (.70) just reaches the .05 level of significance but the five other across-interval (class) differences are not significant. No explanation can be offered for the difference in IQ stability of the 1964-65 Junior and Senior classes other than the nature of the two groups and the situation of the initial testings. Any correlation of

.70 or above must be regarded as quite good, however.

By Sex. The correlation between the freshman test and the later test for 333 male students was .78; for the 489 female students, it was .74.

By Major. The correlations differed somewhat for the students in different major areas. Listed from high to low, they were:

	N	r
Home Economics	57	.82
Social Science	147	.81
Arts & Science	168	.80
Business	103	.78
Technology	109	.77
Education	185	.67
Nursing	53	.62

ANALYSES EXCLUDING FR-FR GROUP

Relation of Gains to Initial IQ Level. The three quartile points for each of the two testings were computed for the 686 cases in which the test-retest interval was at least a full year; and a comparison of differences at these points was made. (See Table 6.) As is usually the case in such comparisons, smaller gains were found for the higher original IQ's. This result can hardly be due to the top Otis Gamma IQ's being limited in possible gains due to some ceiling on the test, since an IQ of 138 is possible for ages 17-6 and over. With Q_3 representing a position, and the Q_3 points

of 116.7 and 120.5 being far below the point of possible limitation due to the test, it must be concluded that there was a real tendency for the higher original IQ's to show the smaller increases.

TABLE 6

IQ's at the Three Quartile Points for the 686 Freshman-Sophomore, Freshman-Junior, and Freshman-Senior Testings

Testing	Q_1	Median	(Mean)	Q_3
First	103.1	109.84	(109.78)	116.72
Second	107.71	114.24	(114.15)	120.50
Gain	4.70	4.40	(4.37)	3.78

To further investigate the nature of the changes taking place among the originally lower and higher-scoring students, a look was taken at what happened to those with initial IQ's below 100, those in the range 100-109, and those of 120 or above. In Table 7 is shown the proportion of Gains to Losses for all 686 cases, and for the three differentiations mentioned above. Not only do the data show that the students with the lower IQ's tended to make greater gain (mean = 7.8), but that the ratio of number of Gains to number of Losses is approximately 20 to 1 for students with initial IQ's below 100, but 6 to 1 for the next relatively low IQ interval of 100-109 (Mean gain 5.7). It is noted that both of these ratios are higher

TABLE 7

Ratio of IQ Gains to Losses for Initial IQ's below 100, Those 100-109, and Those 120 and Above. (Fr-Fr tests excluded)

Initial IQ	N	Number of Gains	Number of Losses	Ratio	Mean Gain In IQ
Below 100	90	79	4	19.7	7.8
100 - 109	244	196	34	5.8	5.7
120 and above	85	44	31	1.4	2.2
All Cases	686	499	141	3.5	4.4

than that of 3.5 gains to 1 loss found for the total group of 686 (excluding Fr-Fr cases). In contrast, for the 85 initial IQ's of 120 and higher the average gain on a second test was only 2.2, and the ratio of number of Gains to number of Losses was 1.4 to 1. This would seem to indicate that any influences due to the college environment had greater effect on those with the lower entrance IQ's, and/or that practice effect was more productive of score increase with the less able entrants.

FR-SR PAIRINGS ONLY (N=128)

If it is assumed that college attendance influences measured intelligence, it would seem that the length of time between the two intelligence tests would be related to the amount of such change. Table 2 gives the Fr-Soph, Fr-Jr, and Fr-Sr gains in means as 4.5, 3.7 and 4.3, respectively; but a statistical test of the three differences among these gains showed that the three were not significantly different from one another. However, the analysis of test-retest changes as related to the items in the test has been made for only

the longest interval, i.e., the Fr-Sr pairings. There were 128 cases of students who took Otis Gamma Em as freshmen, and then took the same test as seniors at least three years later. The responses of each of these students to each of the 80 items in the test were tallied for both the initial and the subsequent test (a total of 20,480 responses). From these data it was possible to determine the items on which the greatest gains were shown, those with a loss, those most frequently omitted before the point at which time probably became a limiting factor on test and retest, and other significant matters.

Table 8 indicates the number of "omits" (item for which no option was marked) for the Freshman-year and the Senior-year test of these 128 students.

TABLE 8

Items Omitted* by the 128 Students Tested as Freshmen and as Seniors.

	First Test (as Freshman)	Second Test (as Senior)
Total Number of Omits	1084	1032
Average, out of 80 Items	8.47	8.06
Number of Omits		
In first fourth, items 1 - 20	10	19
In second fourth, items 21 - 40	21	22
In third fourth, items 41 - 60	95	115
In last fourth, items 61 - 80	958	876
Among first 50 items	48	65
Among last 30 items	1036	967
Total	1084	1032

* No choice of option indicated on answer sheet.

Although the average number omitted on the two tests is shown to be quite similar (8.47 and 8.06 items), the shift from the early part of the test to the latter part is clear. As freshmen these 128 students tended to omit items in the early part of the test less frequently than they did as seniors. Is this increase in "considered skips" evidence of an acquired sophistication in test taking? Did the students as seniors omit items that they judged upon the first reading to be difficult and/or particularly time consuming, in order to attempt more items -- with the possibility of returning to these earlier "skips" if time permitted?

When the fourth quarter of the 80 items (items 61-80) is reached, the greater number of omitted items definitely shifts back to the freshman test, a result suggesting that as seniors the students worked more rapidly and were thus more frequently able to reach the final (the 80th) item.

In tallying the Fr-Sr responses, seven items encountered before time could become much of a factor, stood out as being often omitted. A look was taken at the nature of the specific task required in these items:

Item		Number of Omits	
		By Freshmen	By Seniors
Item 15.	Rather complicated Following Directions item. Involves position of given letter in alphabet and in a given word	5	7
Item 21.	Wrong number in Number Series	8	4
Item 26.	Following Directions. Forming sentence from scrambled words.	7	6
Item 27.	Arithmetic Reasoning	4	6
Item 49.	Complicated Following Directions. Same task as Item 15 above.	11	10

Item	Number of Omits	
	By Freshmen	By Seniors
Item 54. Following Directions, involving reverse alphabetical order.	7	11
Item 55. Involves number of words in a list that can be made from letters in another word.	5	11
Total Omits	47	55

It seems clear that certain time-consuming items were deliberately "passed over." Not one vocabulary or analogy item is among those so omitted through the first 55 of the 80 items, and there are a number of each type among items 1-55.

Table 9 gives a classification of the 80 items in the Otis Gamm Em test. It is not based upon any detailed analysis of the mental processes involved - rather upon the obvious type of task demanded by the item. This classification is thought to be sufficient for the purposes of this study.

TABLE 9

Classification of 80 Items in Otis Quick-Scoring Mental Ability Test, Gamma, Form E_M

Type of Item			Number	
Verbal	-	Vocabulary	13	21
"	-	Synonym or Antonym	8	
Analogies	-	Words	10	16
"	-	Figures	6	
Numerical	-	Series	3	12
"	-	Computation	9	
Logical Selection			11	
Following Direction			12	
Syllogism			5	
Information			3	
Total			80 items	

Table 10 shows the items for which the Fr-Sr Gain in per cent of group answering correctly was at least fifteen. It is noted that the proportion of verbal items (vocabulary, syllogisms) among these 12 high-increase items is notably greater than their proportion in the total test.

TABLE 10

Items for Which the Freshman-Senior Gain in Per Cent of Group Giving Correct Answer was at Least Fifteen

Item Number	Type of Item	With All 128 Cases as the Base				With Only Those Students Attempting the Item as the Base			
		Per Cent Correct		Increase	Per Cent Of Increase*	Per Cent Correct		Increase	Per Cent Of Increase*
		As Fr	As Sr			As Fr	As Sr		
74	Syllogism	19	39	20	105	34	67	33	97
64	Vocabulary#	40	71	31	78	52	83	31	60
71	Verbal Analogy	36	56	20	55	53	81	28	53
51	Syllogism	38	58	20	53	38	58	20	53
67	Number Series	41	59	18	44	58	81	23	40
65	Vocabulary	44	59	15	34	54	69	15	28
58	Number Series	52	68	16	31	61	80	19	31
53	Vocabulary	56	71	15	27	58	73	15	26
52	Vocabulary	73	88	15	21	73	88	15	21
73	Figure Analogy					25	46	21	84
75	Vocabulary					50	71	21	42
69	Vocabulary					36	54	18	50

The word involved is "effect."

* This figure is obtained by dividing the Fr-Sr Increase in Per Cent Correct by the Fr Per Cent Correct.

In Table 11 are shown the items that were answered correctly by fewer of these 128 Fr-Sr students on their Senior test than on their Freshman test. Except for the first five items, however, the drop may be due to chance factors only. It is noted that the five items with the greatest test-retest decrease in correct response involve five different item types.

TABLE.11

Items Answered Correctly by Fewer of the 128 Students on Their Senior Test Than on Their Freshman Test

Item Number	Task	Per Cent Answering Correctly As a Freshman	As a Senior	Decrease*
47	Vocabulary	36	27	9%
77	Spatial-Following Directions	39	33	6%
25	Syllogism	91	86	5%
48	Verbal Analogy	61	56	5%
55	Following Directions	56	52	4%
50	Figure Analogy	42	40	2%
5	Vocabulary	100	98	2%
11	Verbal Analogy	99	98	1%
32	Logical Selection	84	83	1%
76	Spatial-Following Directions	34	33	1%
78	Spatial-Following Direction	28	27	1%

* These relatively small decreases appear more significant when they are contrasted with the general trend to larger "per cents passing" on the repeat test.

Table 12 presents an analysis of the eight cases with a change of more than 15 IQ-points. All were gains. (There were eight other gains this large, but one of the two answer sheets in each of the pairings was not available.)

TABLE 12

Nature of Test-Retest Response to the Eighty Test Items for Eight Students Whose Gain Was Greater Than 15 IQ Points*

Major	Test-Retest Interval	IQ 1st Test	IQ 2nd Test	Frequency of Each Test-Retest Response to 80 Items: Identical Response: Correct, Correct	Identical Response: Inc,+ Inc	Identical Response: Omit, Omit	Identical Response: # Total	Gain: Inc, Correct	Gain: Omit, Correct	Gain: # Total	Loss: Correct, Inc	Loss: Correct, Omit	Loss: # Total	Inc, Omit or Omit, Inc#	Net IQ Gain
Arts-Science	Fr-Sr	103	119	43	1	8	52	3	15	18	2	-	2	8	+16
Arts-Science	Fr-Sr	107	126	46	6	2	54	17	5	22	2	1	3	1	+19
Arts-Science	Fr-Jr	99	121	32	5	3	40	25	6	31	8	1	9	-	+22
Arts-Science	Fr-Soph	111	128	52	4	2	58	7	11	18	-	1	1	3	+17
Business	Fr-Sr	93	112	32	5	9	46	18	4	22	3	-	3	9	+19
Business	Fr-Soph	113	130	51	3	-	54	15	5	20	2	1	3	3	+17
Home Economics	Fr-Soph	102	122	42	4	4	50	8	14	22	2	-	2	6	+20
Technology	Fr-Soph	105	124	45	2	6	53	7	14	21	2	-	2	4	+19
	Sum			343 +	30 +	34 =	407	100 +	74 =	174	21 + 4 =		25	34	
	Per Cent						64%			27%			4%	5%	

+ Incorrect

* There were 8 other instances of a 15-point increase, but one answer sheet in each pairing was not available for observation. Seven of these 8 were Education Majors, one was in Nursing.

The sum of the figures in these four columns in each row (for each student) is 80, the total number of items in the test.

TABLE 13

Percentage Frequency of Test-Retest Responses by Type of Item for Eight Fr-Soph, Fr-Jr, and Fr-Sr Students Who Made IQ Gains of More Than 15 Points

Type of Item Ø	No. of Items	Identical Response				Gain			Loss			No Change in Score		Correct Responses		
		Correct, Correct	Inc, Inc	Omit, Omit	Total #	Inc, Correct	Omit, Correct	Total #	Correct, Inc	Correct, Omit	Total #	Inc, # Omit	Omit, # Inc	1st Test	2nd Test	Gain
Vocabulary	21	62	5	1	68	14	13	27	2	-	2	-	3	64%	89%	25%
Numerical	13	40	-	8	48	15	23	38	3	2	5	1	8	45%	79%	34%**
Analogies	16	60	4	2	66	21	6	27	2	2	4	-	3	62.5%	87%	24.5%
(10 Verbal)		(72.5)	(2.5)	(-)	(75)	(15)	(5)	(20)	(2.5)	-	(2.5)	-	(2.5)	(75)	(93)	(18)
(6 Figure)		(40)	(6)	(6)	(52)	(31)	(6)	(37.5)	(2)	(4)	(6)	-	(4)	(46)	(77)	(31)
Logical Selection	14	67	11	-	78	10	4	14	1	3	4	-	4	71%	81%	10%
Following Directions	11	32	1	22	55	19	14	33	8	-	8	-	4	40%	65%	25%
Syllogisms	5	45	10	5	60	20	12.5	32.5	5	-	5	-	2.5	50%	77%	27%
Total	80	54	5	5	64	16	11	27	3	1	4	-	4	58%	81%	23%

* This categorization of the items is at the level of a general description of the obvious task.

Ø It must be realized that the difficulty of the items is not necessarily identical across the six categories.

The sum of the per cents in these five columns in each row is 100.

** Greatest relative gain - Numerical items.

It is noted that, of the total of 640 test-retest responses to an item (8 students, 80 items each), 407 (63.6%) were identical. A correct answer on the second test after an omit or an incorrest response on the first test more than a year earlier, had a frequency of 174, or 27.2%.

Table 13 shows these same eight cases (IQ gain more than 15 points) analyzed according to type of test item.

LARGE CHANGES IN IQ

A look is now taken at all the IQ changes that would seem to be significant; i.e., those that are probably not due to chance alone. With the standard error of measurement of each individual IQ between 4 and 5 points, the standard error of the difference between the original and the second IQ would be about 6 points. Changes greater than 10, i.e. of 11 or more points, would, therefore, be statistically significant at the .05 level (95 chances out of 100). Table 14 shows the direction, number, and per-cent of these changes by major course for the total group of 822 test-retest pairings. The major courses are listed in order according to the per cent of students showing IQ changes greater than 10 IQ points. It is noted that, with one exception, this order would be unchanged if it were determined by percent of greater-than-10-point gain. Considerable difference is shown among the seven major groups, with the percent of students making gains greater than 10 being highest for the Arts and Science majors (20.2), lowest for the Nursing students (5.7). For the entire group of 822 retestings after ½, 1½, 2½ or 3½ years, 14.1 percent showed an IQ gain of more than 10 points. This is about one student in seven. Fewer than one in 100 (0.7%) lost a significant amount, i.e., more than 10 points.

TABLE 14

Frequency of Changes Greater than Ten IQ Points, by Major Area, for All 822 Test- Retest Pairings

Major	Total Number Of Students	Changes Greater Than 10					
		Number			Per Cent		
		Gains	Losses	Both	Gains	Losses	Both
Business	103	19	2	21	18.5	1.9	20.4
Arts & Science	168	34	-	34	20.2	-	20.2
Technology	109	19	-	19	17.4	-	17.4
Home Economics	57	9	-	9	15.8	-	15.8
Education	185	21	1	22	11.4	.5	11.9
Social Sciences	147	11	2	13	7.5	1.3	8.8
Nursing	53	3	1	4	5.7	1.9	7.6
Total	822	116	6	122	14.1	.7	14.8

STUDY OF ITEMS ATTEMPTED

To learn of the extent to which these relatively large changes (greater than 10) might be due to the answering of more (or fewer) questions on the second test up to about 3½ years after the first, the paired answer sheets were inspected for counts of items attempted. Unfortunately, the 22 Education major cases could not be included in this analysis since the answer sheets for their fist test had been discarded. This reduced the test-retest pairings studied to 100. Table 15 presents the results. It is indicated that of the 95 gains in IQ, 74 (78%) involved the marking of responses to more items; whereas, for the five instances of an IQ loss, three involved a decrease in number of items marked. Without differentiation as to the direction of change it can be said that three-fourths of the students with changes greater than 10 IQ points marked more items (either correctly or incorrectly) on their second test.

TABLE 15

Change in Number of Items Attempted on Second Test for 100 Test-Retest Comparisons with at Least a Ten-Point Difference in IQ

Change in IQ	Number Of Students	Increase in Number of Items Attempted	No Change	Decrease in Number of Items Attempted
+25	2	21,9		
+22	1	5		
+20	2	20,18		
+19	2	13,3		
+18	1	10		
+17	3	22,13,5		
+16	4	22,15,12,7		
+15	13	22,22,18,17,10,10,9,9,8,7,1,1	0	
+14	10	23,18,17,16,14,13,6,6,1,1		
+13	10	22,20,14,11,11,	0, 0	-2,-6,-9
+12	22	20,16,13,12,9,8,7,5,4,3,2	0,0,0,0,0	-1,-1,-2,-4,-5,-7
+11	25	18,17,14,13,13,13,12,10,10,9,9,7,7,7,5,3,2,1,1,1,1	0	-3,-4,-9
Total	95	74	9	12
-11	2		0	-16
-12	1			-14
-13	2	1		-15
Total	5	1	1	3
Grand Total	100	75	10	15

The information presented in this table is to be read as follows: (1) There were two gains of 25 points; in one case 21 more items were marked, in the other 9 more. (2) A score gain of 12 points was made by 22 students; a comparison of their paired answer sheets showed 11 increases ranging from 2 to 20 points in number of items answered, five instances of no difference, and six instances of fewer responses by from one to seven items. (3) Of the five losses of 11, 12 or 13 IQ points, one student responded to 16 fewer items, one to 15 fewer, one to 14 fewer on the second test; one answered the same number of items, another one more.

It appears that responding to more items was definitely a factor in test-retest increases in score, but the data of Table 15 do not reveal whether the trend to answer more items on retests was due to (1) speed (of reading and responding), in which case the final answer mark would be at a later item on the second test, or to (2) fewer "considered" omits throughout the entire section of responses. This question was investigated and is reported in later tables.

WITH FR-FR PAIRINGS EXCLUDED

Since none of the Freshmen took their second test more than seven months after their original test, it is felt that the score gains shown may be relatively superficial because of the possible persistence of some practice effect. (It is noted that an identical form of the Gamma test was given both times - Form Em.) Hence the analyses reported in the balance of this study have eliminated the Fr-Fr comparisons and are based upon Fr-Soph, Fr-Jr, and Fr-Sr pairings with intervals of 1½ years, 2½ years, and 3½ years, respectively. For this group combined there were 94 greater-than-10 changes, but the impossibility of including the Education

TABLE 16

Change in Number of Items Attempted in Relation to Greater-than-Ten-Point Gains or Losses in IQ

	N	Mean IQ			Mean Number of Items Answered			Mean Number Omitted			Mean Number Omitted at End		
		1st Test	2nd Test	Change	1st Test	2nd Test	Change	1st Test	2nd Test	Change	1st Test	2nd Test	Change
Gains	69	104.5	117.7	+13.2	68.1	74.9	+6.8	11.9	5.1	-6.8	10.2	3.5	-6.7
Losses	3	122.0	110.0	-12.0	77.3	62.3	-15.0	2.7	17.7	+15.0	1.7	14.7	+13.0

cases reduces the number to 72 (94-22). Of these 72 significant changes, all but three were gains.

A count was made of the total number of items omitted on the two tests, and another of those omitted at the end. The latter would, for the most part, tend to be those items not even read -- possibly for lack of time. Table 16 presents the results of this analysis.

It is shown that a large part of the average gain of 13.2 points is accounted for by attempts to answer more items, with practically all of these additional items being at the end of the test. It thus appears that these students (those making the large gains) worked more rapidly on the second test. On the average they reached item #70 on the first test, item #77 on the second. (It would be incorrect to interpret

the 6.8 additional responses in relation to the 13.2 IQ gain as meaning "one half of the gain is due to responding to more items," since not all of the additional responses were correct.)

The three losses are too few to make any general interpretation except to note that all answered fewer items on the second test.

BREAKDOWN BY MAJOR CURRICULA

In Table 17 is shown the Mean IQ-change by major curricula -- first, for all students in the study, and then with the short-interval Fr-Jr retestings excluded.

This breakdown of average IQ-Gain by major curricula shows some rather surprising unexplainable differences. Why, at a Negro college in Virginia in 1965-66, would students majoring in the Social Sciences show the lowest average gain in IQ -- only 2.9 points, compared to one of 6.4 for Home Economics and 6.2 for Technology majors? What variables were operating to cause or influence this difference? Until there is further research with other -- and larger -- groups, hypotheses are not justified but the question is an intriguing one.

Reference to Table 14, in which percent of students gaining more than ten points was given for each of the seven major groups, shows some shifts in rank order of the groups from that shown in Table 17, but these are slight. Whichever criterion is used to measure IQ gain, increase in Means or percent making large gain, the three majors ranking lowest are Education, Nursing and the Social Sciences.

In the second part of Table 17 the Mean Gains for the major groups with Fr-Fr testings excluded show slight differences from the total-group results. Rank order in Gains is unchanged except that the Social Science group, which contained no Freshman students, is replaced in its lowest position by the small group of Nursing students.

TABLE 17

Mean IQ's on First Test and on Later Retest, by Major Course, for (1) All 822 Students and for (2) Sophomore, Junior, and Senior Retestings Only

Major *	All 822 Cases						686 Fr-Soph, Fr-Jr, Fr-Sr			
		Mean			S.D.			Mean		
	N	1st test	2nd test	Gain	1st test	2nd test	N	1st test	2nd test	Gain
Home Economics	57	106.3	112.7	6.4	10.5	10.0	42	106.8	112.8	6.0
Technology	109	109.7	115.9	6.2	9.5	8.5	66	111.0	116.7	5.7
Arts-Sciences	168	112.4	117.9	5.5	8.9	7.8	118	112.2	117.8	5.6
Business	103	108.0	112.1	4.1	9.2	9.1	103	108.0	112.1	4.1
Education	185	108.7	111.9	3.2	9.4	11.2	185	108.7	111.9	3.2
Nursing	53	112.4	115.4	3.0	6.2	6.4	25	113.3	115.9	2.6
Social Science	147	110.1	113.0	2.9	8.5	8.6	147	110.1	113.0	2.9
Total	822	109.8	114.3	4.5	9.2	9.4	686	109.8	114.0	4.2

* The major groups are listed in the order of average gain made by each in the total group of 822 cases.

The range of IQ-Gain across the seven major groups would seem to be quite considerable -- from 2.9 to 6.4 points. This imbalance across curricula could be a function of many variables; for instance, quality of faculty in different departments, level of initial IQ (Home Economics majors had lowest average IQ upon entrance, and made the greatest gain), sex of students in the several curricular groups, differences in motivation, etc.

When all Majors are combined, it is noted that the initial IQ for the total group of 822 and that for only those retested as Sophomores, Juniors and Seniors were identical, 109.8. The Gain was 4.5 IQ points -- to 114.3 -- for the total group, but only 4.2 -- to 114.0 -- when the Freshman test pairings were excluded.

The relation of IQ level to choice of major area, as shown in the column "Mean, 1st Test" in Table 17, typifies the traditional pattern of lower-scoring students seeking, or being encouraged into, less academically-oriented areas. Students majoring in Home Economics and in Business had the lowest average IQ's at entrance, Arts and Science, and Nursing the highest.

(It would be interesting to note the difference in the Institute's present average IQ, now that a distinct Department of Architecture with special admissions requirements has been established.)

SOCIAL SCIENCE MAJORS

One of the seven curricula -- the 145 Social Science majors -- was subjected to a special analysis; it was felt that students in these academic courses would tend to be in the forefront of any intelligence gains made during the college years, but the group was found to have made the least average gain, namely 2.9 IQ points. Table 18 shows the

results for the three pairings over time intervals of 1½, 2½ and 3½ years, respectively. There is no explanation for the imbalance in net changes, that is, why the 44 Juniors showed as many losses as gains, and the net gain was an insignificant .8 IQ point. The correlations shown in the final column of Table 18 indicate a high degree of relationship between the intelligence demonstrated as a freshman and that as an upper classman.

TABLE 18

IQ Changes for 145 Social Science Majors

Pairing	N	Gain in Group Means: Mean IQ 1st Test	Mean IQ 2nd Test	Mean IQ Gain	S.D. 1st Test	S.D. 2nd Test	Correlation between 1st and 2nd IQ
Freshman-Sophomore	71	110.6	114.4	3.8	9.2	8.8	.83
Freshman-Junior	44	109.7	110.5	.8	8.6	8.9	.79
Freshman-Senior	30	110.4	114.2	3.8	8.1	8.0	.78

Individual Changes

Freshman to Sophomore:	51 gained - an average of 6.1 points
	7 had identical IQ's
	13 lost - an average of 3.2 points
Freshman to Junior:	20 gained - an average of 6.3 points
	4 had identical IQ's
	20 lost - an average of 3.8 points
Freshman to Senior:	22 gained - an average of 6.0 points
	2 had identical IQ's
	6 lost - an average of 3.7 points

SCHOLASTIC APTITUDE TEST RESULTS

The year to the present study, all Freshman students at Hampton Institute took the College Board Scholastic Aptitude Test after arrival on campus. (The timing is of note because SAT scores did not become a part of admissions screening criteria until the following year.) When these Freshmen became Sophomores, special arrangements were made for retesting with the SAT. Sixty three of these students, with two Otis and two SAT's, were Social Science majors. Table 19 shows the correlation between the Otis text and SAT Verbal to be .78 for first testings, .74 for second; Otis with SAT Mathematical was slightly lower, 66 for Freshman tests, .69 for second tests as Sophomores.

It is noted that the Otis IQ showed slightly greater stability over the year's interval (.84) than did SAT-V (.79) or

TABLE 19

Some Intercorrelations among Otis Gamma IQ's and Scholastic Aptitude Test Scores for 63 Social Science Majors Who Were Freshmen in the Fall of 1964, Sophomores in 196[illegible]

Test	1964			1965		
	Otis IQ	SAT-V	SAT-M	Otis IQ	SAT-V	SAT-M
Otis 1964	-	.78	.66	.84	-	-
SAT-V 1964		-			.79	
SAT-M 1964			-			.73
Otis 1965				-	.74	.69
Mean	110.8	408	395	114.8	426	392
S.D.	9.4	92	82	8.7	92	78

SAT-M (.73). Gain in IQ was 4.0, a statistically significant change; the 18 point gain in SAT-V, and 3-point loss in the Mathematical section were too slight to have significance.

It is interesting to note this Hampton relation between Otis IQ and SAT scores as compared with that found for three other studies in which the two tests have been given to the same student group.[1] Table 20 gives the observed correlatinns, and the SAT score for given Otis IQ as determined from the linear regression equation. Although no definitive conclusions may be made from a group as small and as "selected" as the 63 Hampton Social Science majors, it appears that <u>for given IQ's</u> the Hampton group tended to do less well on the SAT than did the other three groups. No explanation is offered other than the possibility that college admission did not depend on their SAT performance, as it quite probably did for the other groups -- <u>they were already there</u>.

SUMMARY

In this study the Otis Gamma was administered to Freshman, Sophomore, Junior and Senior students in the spring of 1966. The obtained IQ's were compared with those made by these same students

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1. A fourth study, dealing with <u>total</u> SAT score only, is that of Willingham and Strickland, "Conversion Tables for Otis Gamma and Scholastic Aptitude Test. <u>Personnel and Guidance Journal</u> 41:356-58. December 1962.

TABLE 20

Scholastic Aptitude Test Verbal and Mathematical Scores Corresponding to Otis Gamma IQ's, for Four Groups*

Otis IQ	SAT-V				SAT-M			
	Rosen-garten N=524	College A N=378	College B N=277	Hampton Soc Sc Majors N=63	Rosen-garten	College A	College B	Hampton Soc Sc Majors
140	630	653	660	631	592	658	669	563
135	595	618	626	592	562	624	625	534
130	560	584	593	554	532	589	582	506
125	525	550	561	516	502	556	538	477
120	490	516	529	478	472	522	494	448
115	455	481	498	440	442	488	450	419
110	420	447	466	402	412	453	406	390
105	385	413	432	364	382	418	363	361
100	350	379	398	326	352	384	319	333
95	315	345	365	287	322	349	275	304
90	280	311	332	249	292	315	231	275
Correlation with Otis IQ	.69	.64	.60	.78	.62	.65	.70	.66

*Rosengarten: Otis test administered late in Grade 11, SAT late in Grade 12, by Dr. William Rosengarten, Jr., Director of Special Services, Roslyn Public Schools, Roslyn, N. Y. Reported in Test Service Bulletin No. 103, Test Department, Harcourt, Brace & World, New York.

College A: Private co-educational college in California.

College B: Roman Catholic women's college in Midwest.
Order of administration of tests was reversed from that of Rosengarten study: SAT was given in Grade 12, Otis upon college entrance. Results for both colleges are reported in Test Data Report, No. 43. Test Department, Harcourt, Brace & World, New York.

Hampton: Both Otis and SAT given at college entrance.

in the fall of their Freshman year. Average gain for the entire group was 4.47 IQ points, with Freshmen making the largest average gain (5.73) although the time interval between their two tests was shortest. Male students gained 5.62, female 3.49. Home Economics majors surpassed all other curricula in average gain (6.4 points); Social Science majors improved least (2.9 points). Students with initial IQ's below 90 showed an average gain of 7.8; for those above 120, the average gain was 2.2.

An analysis of <u>individual</u> changes from Freshman to later test showed that 161, or 20 per cent, were of 10 or more IQ-points. (Of these 161, 154 were gains.) If a 13-point gain, twice the standard error of the difference between two IQ's, is set as the criterion of significance (.05 level) the proportion of the 822 students making a significant gain was one in thirteen.

The product-moment correlations between IQ on the first and the second test were .76, .78, .80 and .70 for the time intervals of 1/2, 1½, 2½ and 3½ years, respectively.

Because of the relatively small number of significant individual gains, the fact that the seven-month Freshman-Freshman retest interval showed the greatest gains, the greater number of items <u>attempted</u> on the second test, and some evidence of what would appear to be "calculated" omissions by upper classmen of complicated, time-consuming items through the early part of their <u>second</u> test, there would appear to be no basis for concluding that the college years have had much real impact upon the intelligence of the 822 Hampton Institute students involved in this study.

DISCUSSION OF FINDINGS

The findings are inconclusive and not explainable without further research. Two prime variables are probably operating throughout the study, practice effect (including speed) and socio-environmental influences.

There is no sure way of separating out from the first variable such factors as test sophistication, the knack of test-taking and all the subtle elements that comprise the traditional concept of practice effect. The Freshman-Freshman gain in IQ was the greatest throughout the study but this gain must not be confused with and does not imply a real gain in intellectual ability. Although it was a statistically significant gain, it is important to note that in this instance practice effect was believed to be the crucial variable because of the short time between first and second testings. If time had been a prime influence one would then expect greater or at least comparable gain over the longer 1½ to 3½ year intervals. Since this did not happen, one would question the extent to which the observed score gains were due to the effects of one to three years of college experience.

Most of the students making the larger gains were shown to have answered more questions on the second testing; but some answered fewer. There were evidences of both greater speed and greater caution. Was graduation so close that some were enervated rather than motivated? Were they test-weary rather than test-oriented? Were scores influenced by possible greater anxiety as entering Freshmen? Were they a more reluctant

captive sample at the first testing? At what point and in what way did the environment have the least or greatest influence on those whose intelligence may have truly changed? What were the social stimuli involved or was it a matter of a particular personality, or a combination of the two? Was there a kind of cognitive style that could identify those who gained or lost significantly?

Let us look to the environmental factors. Whatever else is to be said, we can begin by reiterating that time was not a crucial variable in this study. Hypotheses are limited at this point without comparable research at other educational levels, with northern colleges, with all white, with integrated and with cross-cultural samples; however, the present study does encourage many questions. These questions are not intended to be all inclusive but pertain to the kinds of multiple factors operating and presumably influencing behavior.

a. What about the personal and academic self-concept of the students in the sample? Is this mainly a function of being Negro in America, being at the precarious ages of 18-21, being a college student, or being a student at a Negro college? Does the Negro child develop in a pattern coerced by the caste-color system with resultant behavior patterns, and how is this reflected in the self-concept and the measured IQ?

b. Assuming the Negro student to have natural and enormous built-in frustrations, can one also assume this same frustration is effective in producing change in a proven area of upward educational and social mobility? Or is the frustration so pervasive it blocks growth and becomes self-aggressive?

c. Does the supposedly more paternalistic college environment attract a more dependent student and foster less need-achievement?

d. Is there a positive correlation between those students who change scores and the stability of their respective home unit? (This question stems from earlier research on the Negro family by such researchers as E. Franklin Frazier, Charles S. Johnson, Melville J. Herskovits, and others).

e. The study covered 1962-66. Could one assume that both Negro and White attitudes were in a dramatic state of flux and change at this time, with resultant behavior change? How does this assumption relate to the findings in the study?

f. Was the change in IQ a function of religious beliefs; i.e. do devout Negro Protestants seek a Southern supposedly more fundamentalist college rather than a northern "God-less" one? If so, is this in itself, a unique motivating factor or is motivation influenced by the religious reality found on campus?

g. How many students sought Hampton Institute primarily as a marriage broker? At this predominantly Negro college, students are exposed to the fraternity-sorority social upward mobility route, a phenomenon strongly emphasized at the Negro college. Does this factor influence change in demonstrated IQ?

h. Was change in IQ a function of the "Southern Comfort" of the Negro college? Do students there tend to prefer to be non-involved and to work within the walls of segregation, and, if so, how does this factor relate to test motivation?

i. Why was the male versus the female gain ratio so highly significant? Was this a function of admissions screening policy? Was it related to the changed status of the Negro male in both the Negro and the larger society? Did the rapidly expanding Hampton Institute Placement Program influence the aspirations and motivation of the male students? Did recent Civil Rights activists supply models for traditionally model-less Negro males? Is this finding transferable to White college males?

j. How does one interpret the non-gain for the Social Science group from the Freshman to the Junior year? In addition to no significant gain, as many lost as gained. Could one assume that students majoring in the Social Sciences would be caught up in the excitement of change and power and politics? As noted in Table 17, the students in this group showed the least gain. (The correlations of around .80 for the total sample are good for a 1-3 year interval but the sample is too small for "true" comparisons. The trend is as would

be expected and although greatest change occurred in the Freshman-Freshman interval, the overall means were only slightly changed when these short-time-interval scores were excluded from the analysis.)

The breakdown by major curricula and the item analysis might well have special significance, but the multiple social factors operating simultaneously limit further hypotheses at this time.

Looking once more at the sample, can we assume that the Sophomore, Junior and Senior students were "selected" groups; i.e., by the end of the Freshman year can we assume that the academic risks and the less motivated students were weeded out, by invitation or otherwise? Or is the group equated by the highly motivated student who transfers, or psychologically drops out of the perceived intellectually arid and relatively conservative atmosphere of the campus? What are the differentiating factors of those who remain? Since the Freshman group mean was not significantly different from that of the entire sample, it is reasonable to assume there were matching drop-outs and for a variety of reasons.

This study can hardly be considered as one on the effect of environment on IQ, since the students involved were 18-22 years of age. The data, however, support Bloom's findings that after the age of around eight years the environment does not significantly influence intellectual ability.[1] Throughout the analyses the students with the lower initial intelligence quotients tended, generally,

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[1] Bloom, Benjamin S. Stability and Change in Human Characteristics. 1964. John Wiley & Sons. New York.

to make the greatest gains but, although the difference in group means was statistically significant, only a small proportion of the individual gains were large enough, in relation to the error of measurement, to be interpreted as evidence of true growth in mental ability.

The findings are inconclusive. One is still wary of interpretation of the IQ isolated from knowledge of the campus culture within which it operates. We do not know the relationship of social stimuli to demonstrated changes in IQ; however, the data show that such changes (gains) are not positively related to time (Freshman to Senior year in college.) More intensive student and campus cultural research is needed to provide answers to the kinds of questions prompted by this study.